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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/582,390	06/09/2006	Michael D. Craven	30794104USWO	3883

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EXAMINER	
KHOSRAVIANI, ARMAN	

ART UNIT	PAPER NUMBER
2818	

MAIL DATE	DELIVERY MODE
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/582,390	CRAVEN ET AL.	
	Examiner	Art Unit	
	ARMAN KHOSRAVIANI	2818	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *14 February 2008*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1 and 5-16* is/are pending in the application.

4a) Of the above claim(s) *2-4* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1 and 5-16* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application

6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.
>
> The factual inquiries set forth in **Graham v. John Deere Co., 383 U.S. 1, 148 USPQ 459 (1966)**, that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows: ***(See MPEP Ch. 2141)***
>
> a. Determining the scope and contents of the prior art;
> b. Ascertaining the differences between the prior art and the claims in issue;
> c. Resolving the level of ordinary skill in the pertinent art; and
> d. Evaluating evidence of secondary considerations for indicating obviousness or nonobviousness.
>
> This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

2. Claims 1, 5-12 and 16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Dwilinski et al. (US 2006/0138431) in view of Hata (US 6,977,953).

Regarding claim 1, Dwilinski teaches the method for forming a nitride semiconductor device, comprising: (a) growing one or more gallium nitride (GaN) layers

on a substrate (claim 10, pars. 59, 108-111); and (b) growing one or more non-polar a-plane (Al,In,Ga)N layers off of a grown surface of the GaN layers (par. 16, claim 10) to form at least one non-polar a-plane quantum well. Dwilinski lacks growing Boron to form the one or more non-polar a-plane (Al,B,In,Ga)N layers off of a grown surface of the GaN layers.

However, Hata teaches (col.9, ll.40-45 and col.52, l.43 – col.53, l.4) using boron in a composition of (Al,Ga,In)N to form at least one quantum well.

Since both Hata and Dwilinski teach the method of forming a nitride semiconductor device above, it would have been obvious to include boron for forming the one or more non-polar a-plane (Al,B,In,Ga)N layers off of a grown surface of the GaN layers of Hata in Dwilinski for the benefit of obtaining a desired emission spectra (col.52, l.43 – col.53, l.4).

Regarding claim 5, Dwilinski teaches (pars. 15-17, GaN planes: par. 109, substrate planes: claim 3) the method above, wherein the GaN layers are non-polar a-plane GaN layers and the substrate is an r-plane substrate for the same benefit of improving the performance of state-of-the-art optoelectronic and electronic devices by making quantum structures not influenced by polarization-induced electric fields.

Regarding claim 6, Hata teaches (col.52, ll.34-42) the substrate is a sapphire substrate.

Regarding claim 7, Dwilinski teaches (pars. 81-84) the method above, wherein the growing step (a) comprises: (1) annealing the substrate; (2) depositing a nitride-based nucleation layer (par. 71) on the substrate (Applicant admits that nucleation

layers and uses precursors such as trimethylgallium and ammonia are commonly used in the growth of c-plane nitride semiconductors on pars. 27-28); (3) growing the GaN layer on the nucleation layer; and (4) cooling the GaN under a nitrogen overpressure (par. 81 wafer is processed in MOCVD device under nitrogen atmosphere from annealing to cooling process) for the same benefit of improving the performance of state-of-the-art optoelectronic and electronic devices by making quantum structures not influenced by polarization-induced electric fields.

Regarding claim 8, Dwilinski teaches (e.g. using MOVCD in Example 1, par. 92 to pars. 93-101) the method above, wherein the growing steps are performed by a method selected from a group comprising metalorganic chemical vapor deposition (MOCVD), molecular beam epitaxy (MBE), liquid phase epitaxy (LPE), hydride vapor phase epitaxy (HVPE), sublimation, and plasma-enhanced chemical vapor deposition (PECVD) for the same benefit of improving the performance of state-of-the-art optoelectronic and electronic devices by making quantum structures not influenced by polarization-induced electric fields.

Regarding claim 9, Dwilinski teaches a device manufactured using the method of above (e.g. Example 1, pgs. 6-7, in Example 1 a nitride semiconductor laser device is manufactured par. 89) for the same benefit of improving the performance of state-of-the-art optoelectronic and electronic devices by making quantum structures not influenced by polarization-induced electric fields.

Regarding claim 10, Dwilinski teaches a nitride semiconductor device comprising one or more gallium nitride (GaN) layers grown on a substrate, and one or more non-

polar a-plane quantum wells formed from one or more non-polar a-plane (Al,In,Ga)N layers grown off of a grown surface of the GaN layers, wherein the nitride semiconductor device is created using a process comprising: (a) growing one or more gallium nitride (GaN) layers on a substrate (claim 10, pars. 59, 108-111); and (b) growing one or more non-polar a-plane (Al,In,Ga)N layers off of a grown surface of the GaN layers (col. 3/lls. 10-16) to form at least one non-polar a-plane quantum well. Dwilinski lacks growing Boron to form the one or more non-polar a-plane (Al,B,In,Ga)N layers off of a grown surface of the GaN layers.

However, Hata teaches (col.9, ll.40-45 and col.52, l.43 – col.53, l.4) using boron in a composition of (Al,Ga,In)N to form at least one quantum well.

Since both Hata and Dwilinski teach the method of forming a nitride semiconductor device above, it would have been obvious to include boron for forming the one or more non-polar a-plane (Al,B,In,Ga)N layers off of a grown surface of the GaN layers of Hata in Dwilinski for the benefit of obtaining a desired emission spectra (col.52, l.43 – col.53, l.4).

Regarding claim 11, Dwilinski teaches a nitride semiconductor device, comprising: (a) one or more gallium nitride (GaN) layers grown on a substrate (claim 10, pars. 59, 108-111); and (b) growing one or more non-polar a-plane quantum wells formed from one or more non-polar a-plane (Al,In,Ga)N layers grown off of a grown surface of the GaN layers (col. 3/lls. 10-16). Dwilinski lacks growing Boron to form the one or more non-polar a-plane (Al,B,In,Ga)N layers off of a grown surface of the GaN layers.

However, Hata teaches (col.9, ll.40-45 and col.52, l.43 – col.53, l.4) using boron in a composition of (Al,Ga,In)N to form at least one quantum well.

Since both Hata and Dwilinski teach the method of forming a nitride semiconductor device above, it would have been obvious to include boron for forming the one or more non-polar a-plane (Al,B,In,Ga)N layers off of a grown surface of the GaN layers of Hata in Dwilinski for the benefit of obtaining a desired emission spectra (col.52, l.43 – col.53, l.4).

Regarding claim 12, Dwilinski teaches (par. 97) the quantum well ranges in width (40 Angstroms) from approximately 20 Angstroms to approximately 70 A.

Regarding claim 16, Hata teaches (col.9, ll.40-45 and col.52, l.43 – col.53, l.4) the quantum well is a GaN/AlGaN quantum well.

3. Claims 13-15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Dwilinski et al. (US 2006/0138431) in view of Hata (US 6,977,953) and in further view of Nagahama et al. (US 6,677,619).

Regarding claim 13, the combination of Dwilinski and Hata fails to teach the quantum well having a doped barrier.

However, Nagahama teaches (col.21, l. 59 – col.22, l. 12) the quantum well having a doped barrier.

Since Nagahama in combination with Hata and Dwilinski teach the method of forming a nitride semiconductor device above, it would have been obvious to have the quantum well with a doped barrier of Nagahama in the combination of Hata and

Dwilinski for the benefit of improving power efficiency and lowering the threshold cirrent and voltage of the nitride semiconductor device (col.3, ll.1-11 and col.3, l.60 – col.4, l.16).

Regarding claim 14, Nagahama teaches (col.21, l. 59 – col.22, l. 12) the doped barrier is doped with silicon.

Regarding claim 15, Nagahama (col.21, l. 59 – col.22, l. 12) discloses the claimed invention except for the doped barrier is doped with silicon with a dopant concentration of $2x10^8$ cm^{-3} (Nagahama teaches $8x10^8$ cm^{-3}). It would have been obvious to one having ordinary skill in the art at the time of the invention was made to have the doped barrier doped with silicon with a dopant concentration of $2x10^8$ cm^{-3}, since it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art. *In re Boesch, 617 F.2d 272, 205 USPQ 215 (CCPA 1980).*

Conclusion

4. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Arman Khosraviani whose telephone number is 571-272-2554. The examiner can normally be reached on Monday to Friday, 7:30a - 5:00p (Eastern Time).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Angela Ortiz can be reached on 571-272-1206. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

AK

/DAVID VU/
Primary Examiner, Art Unit 2818